

54ACTQ16541

16-Bit Buffer/Line Driver with TRI-STATE Outputs

General Description

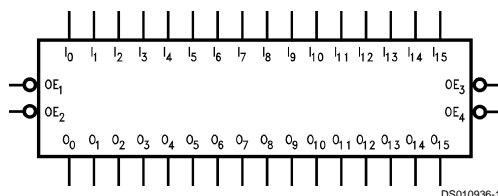
The 'ACTQ16541 contains sixteen non-inverting buffers with TRI-STATE outputs designed to be employed as a memory and address driver, clock driver, or bus oriented transmitter/receiver. The device is byte controlled. Each byte has separate TRI-STATE control inputs which can be shorted together for full 16-bit operation.

The 'ACTQ16541 utilizes NSC Quiet Series technology to guarantee quiet output switching and improved dynamic threshold performance. FACT Quiet Series™ features GTO™ output control for superior performance.

Features

- Utilizes NSC FACT Quiet Series technology
- Guaranteed simultaneous switching noise level and dynamic threshold performance
- Separate control logic for each byte
- 16-bit version of the 'ACTQ541
- Outputs source/sink 24 mA

Logic Symbol

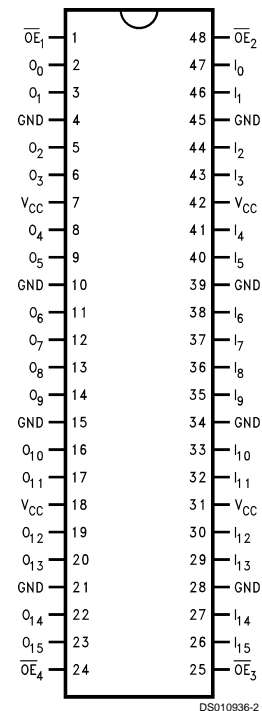


Pin Description

Pin Names	Description
\overline{OE}_n	Output Enable Input (Active Low)
I_0-I_{15}	Inputs
O_0-O_{15}	Outputs

Connection Diagram

Pin Assignment for CERPAK



GTO™ is a trademark of National Semiconductor Corporation.
 TRI-STATE® is a registered trademark of National Semiconductor Corporation.
 FACT™ and FACT Quiet Series™ are trademarks of Fairchild Semiconductor Corporation.

Functional Description

The 'ACTQ16541 contains sixteen non-inverting buffers with TRI-STATE standard outputs. The device is byte controlled with each byte functioning identically, but independent of the other. The control pins can be shorted together to obtain full 16-bit operation. The TRI-STATE outputs are controlled by an Output Enable (\overline{OE}_n) input for each byte. When \overline{OE}_n is LOW, the outputs are in 2-state mode. When \overline{OE}_n is HIGH, the outputs are in the high impedance mode, but this does not interfere with entering new data into the inputs.

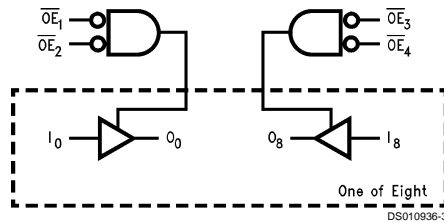
Truth Tables

Inputs			Outputs
\overline{OE}_1	\overline{OE}_2	I_0-I_7	O_0-O_7
L	L	H	H
H	X	X	Z
X	H	X	Z
L	L	L	L

Inputs			Outputs
\overline{OE}_3	\overline{OE}_4	I_8-I_{15}	O_8-O_{15}
L	L	H	H
H	X	X	Z
X	H	X	Z
L	L	L	L

H = High Voltage Level
 L = Low Voltage Level
 X = Immaterial
 Z = High Impedance

Logic Diagram



Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage (V_{CC})	-0.5V to +7.0V
DC Input Diode Current (I_{IK})	
$V_I = -0.5V$	-20 mA
$V_I = V_{CC} + 0.5V$	+20 mA
DC Output Diode Current (I_{OK})	
$V_O = -0.5V$	-20 mA
$V_O = V_{CC} + 0.5V$	+20 mA
DC Output Voltage (V_O)	-0.5V to $V_{CC} + 0.5V$
DC Output Source/Sink Current (I_O)	±50 mA
DC V_{CC} or Ground Current per Output Pin	±50 mA
Junction Temperature	
CDIP	+175°C
Storage Temperature	-65°C to +150°C

Recommended Operating Conditions

Supply Voltage (V_{CC})	
'ACTQ	4.5V to 5.5V
Input Voltage (V_I)	0V to V_{CC}
Output Voltage (V_O)	0V to V_{CC}
Operating Temperature (T_A):	
54ACTQ	-55°C to +125°C
Minimum Input Edge Rate (dV/dt)	
'ACTQ Devices	125 mV/ns
V_{IN} from 0.8V to 2.0V	
V_{CC} 4.5V, 5.5V	

Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. National does not recommend operation of FACT™ circuits outside databook specifications.

DC Electrical Characteristics for 'ACTQ Family Devices

Symbol	Parameter	V_{CC} (V)	54ACTQ	Units	Conditions
			$T_A = -55^\circ\text{C}$ to +125°C		
			Guaranteed Limits		
V_{IH}	Minimum High Input Voltage	4.5	2.0	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$
		5.5	2.0		
V_{IL}	Maximum Low Input Voltage	4.5	0.8	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$
		5.5	0.8		
V_{OH}	Minimum High Output Voltage	4.5	4.4	V	$I_{OUT} = -50 \mu A$
		5.5	5.4		
		4.5	3.70	V	(Note 2) $V_{IN} = V_{IL}$ or V_{IH} $I_{OH} = -24 \text{ mA}$
		5.5	4.70		$I_{OH} = -24 \text{ mA}$
V_{OL}	Maximum Low Output Voltage	4.5	0.1	V	$I_{OUT} = 50 \mu A$
		5.5	0.1		
		4.5	0.50	V	(Note 2) $V_{IN} = V_{IL}$ or V_{IH} $I_{OL} = 24 \text{ mA}$
		5.5	0.50		$I_{OL} = 24 \text{ mA}$
I_{OZ}	Maximum TRI-STATE Leakage Current	5.5	±10.0	μA	$V_I = V_{IL}, V_{IH}$ $V_O = V_{CC}, \text{GND}$
I_{IN}	Maximum Input Leakage Current	5.5	±1.0	μA	$V_I = V_{CC}, \text{GND}$
I_{CCT}	Maximum I_{CC}/Input	5.5	1.6	mA	$V_I = V_{CC} - 2.1V$
I_{CC}	Max Quiescent Supply Current	5.5	160.0	μA	$V_{IN} = V_{CC}$ or GND
I_{OLD}	Minimum Dynamic Output Current (Note 3)	5.5	50	mA	$V_{OLD} = 1.65V \text{ Max}$
I_{OHD}			-50	mA	$V_{OHD} = 3.85V \text{ Min}$

DC Electrical Characteristics for 'ACTQ Family Devices (Continued)

Symbol	Parameter	V _{CC} (V)	54ACTQ	Units	Conditions
			T _A = -55°C to +125°C		
			Guaranteed Limits		
V _{OLP}	Quiet Output Maximum Dynamic V _{OL}	5.0	1.2	V	(Note 4)
V _{OLV}	Quiet Output Minimum Dynamic V _{OL}	5.0	-1.2	V	(Note 4)

Note 2: All outputs loaded; thresholds associated with output under test.

Note 3: Maximum test duration 2.0 ms; one output loaded at a time.

Note 4: Maximum number of outputs that can switch simultaneously is n. (n - 1) outputs are switched HIGH and one output held HIGH.

AC Electrical Characteristics

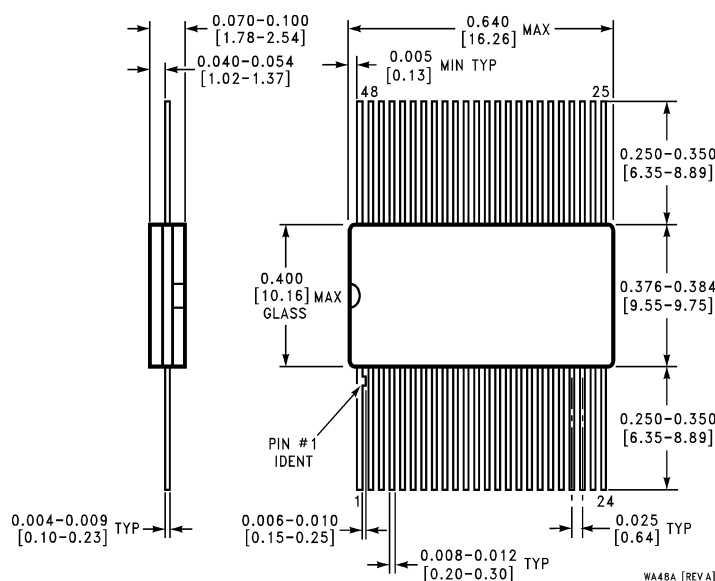
Symbol	Parameter	V _{CC} (V) (Note 5)	54ACTQ		Units
			T _A = -55°C to +125°C C _L = 50 pF		
			Min	Max	
t _{PLH} ,	Propagation Delay	5.0	3.0	10.3	ns
t _{PHL}	Data to Output		3.0	10.0	
t _{PZH} ,	Output Enable Time	5.0	3.0	10.5	ns
t _{PZL}			3.0	11.5	
t _{PHZ} ,	Output Disable Time	5.0	3.0	11.0	ns
t _{PLZ}			3.0	11.0	

Note 5: Voltage Range 5.0 is 5.0V ± 0.5V.

Capacitance

Symbol	Parameter	Max	Units	Conditions
C _{IN}	Input Capacitance	5	pF	V _{CC} = 5.0V
C _{PD}	Power Dissipation Capacitance	100	pF	V _{CC} = 5.0V

Physical Dimensions inches (millimeters) unless otherwise noted



**48-Lead CERPAC
NS Package Number WA48A**

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



National Semiconductor Corporation
Americas
Tel: 1-800-272-9959
Fax: 1-800-737-7018
Email: support@nsc.com

www.national.com

National Semiconductor Europe
Fax: +49 (0) 1 80-530 85 86
Email: europe.support@nsc.com
Deutsch Tel: +49 (0) 1 80-530 85 85
English Tel: +49 (0) 1 80-532 78 32
Français Tel: +49 (0) 1 80-532 93 58
Italiano Tel: +49 (0) 1 80-534 16 80

National Semiconductor Asia Pacific Customer Response Group
Tel: 65-2544466
Fax: 65-2504466
Email: sea.support@nsc.com

National Semiconductor Japan Ltd.
Tel: 81-3-5620-6175
Fax: 81-3-5620-6179